Notes on Human Origins

Natural Selection II Lecture

Jan. 15, 2015

Evolution of adaptations	Adaptations evolve through the accumulation of small variations. Small changes are typically more adaptive to the environment and confer selective benefit compared to large changes. Similarly, intermediate adaptations must be adaptive. Small variations are also more likely to construct functioning adaptations, period.
Discontinuous adaptations	Complex structures are unlikely to evolve fully formed. As Dawkins pointed out, a tornado in a junkyard will not assemble a 747 and monkeys on keyboards are not likely to write shakespeare
Convergent evolution	Because each small adaptation must be favored in selection, adaptations in different species often converge to similar designs. Examples include spherical gradient lenses and ”wolf-like” design in marsupial & placental wolves.
The pace of evolutionary adaptation	The rate of evolutionary change can be extremely rapid. In Darwin's day, the timescales evolution was thought to require was millions of years, longer than the predicted age of the Earth! We now know that speciation can occur in as few as 10,000 generations, a timescale much shorter than expected. Also, the Earth is **b**illions of years old, not **m**illions.
Darwin's difficulties	Darwin's theory of Natural Selection was widely criticized when it was published. Most importantly, Darwin's theory was unable to explain the rise of diversity. Specifically, his hypothesis of *blending inheritance* led to the gradual loss of variation in populations due to averaging. Fleeming Jenkin noted that this would quickly lead to cessation of natural selection. Additionally, Darwin was unable to account for an increase in population diversity under blending inheritance. Other naturalists considered discontinuous evolution the explanation for the emergence of diversity.

Summary

Why is 5% of an eye useful? What were Darwin's difficulties?	Because every incremental stage of a complex adaptation is favored, even 5% confers selective benefit to an organism. Discontinuous adaptations are too improbable to explain the existence of extremely fragile and complicated structures such as the eye or placental tissues. However, Darwin was unable to describe the incremental stages of such structures at the time of his work. He was also unable to explain the emergence of diversity in populations under blending inheritance. These failures slowed the adoption of natural selection in the scientific consciousness.